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EXAMINER	
VALENTIN, JUAN D	

ART UNIT	PAPER NUMBER
2877	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/824,156	STIRTON, JAMES BROC	
	Examiner	Art Unit	
	Juan D. Valentin II	2877	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *Appeal Brief, 01/24/2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2 and 4-37* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2 and 4-37* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. In view of the Appeal Brief filed on 01/24/2005, PROSECUTION IS HEREBY REOPENED. New grounds of rejection for claims 1, 2, & 4-37 set forth below. Applicant's arguments filed 01/24/2005 regarding claims 1, 2, & 4-7 have been fully considered but they are not persuasive. Please see rejection below for examiner's response to arguments regarding claims 1, 2, & 4-7.

To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) request reinstatement of the appeal.

If reinstatement of the appeal is requested, such request must be accompanied by a supplemental appeal brief, but no new amendments, affidavits (37 CFR 1.130, 1.131 or 1.132) or other evidence are permitted. See 37 CFR 1.193(b)(2).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1,2, & 4-7 rejected under 35 U.S.C. 103(a) as being unpatentable over Kleinknecht (USPN '123) in view of Kotani (USPN '362).

Claim 1

Kleinknecht discloses in conjunction with Fig. 1, a method comprising of providing a semiconductor substrate 10 and forming a first plurality of implant regions 14 in the substrate 10. Kleinknecht discloses illuminating 18 a first plurality of implant regions 14 with a light source 26 in a scatterometry tool generating a trace profile corresponding to an implant profile of said implant regions (col. 3, lines 5-42).

Kleinknecht substantially teaches the claimed invention except that it fails to show provide a library comprised of a plurality of calculated trace profiles of implant regions having varying implant profiles. Kotani shows that it is known to provide a library (database 15, Fig. 1) comprised of a plurality of calculated trace profiles of implant regions having varying implant profiles (col. 1, lines 22-25, col. 3, line 57-col. 4, line 5 & col. 4, line 53-col. 5, line 5) for manufacturing semiconductor devices. It would have been obvious to someone of ordinary skill in the art to combine the device of Kleinknecht with the library (database 15, Fig. 1) of calculated (statistical computation) data of Kotani for the *purposes of providing a means for managing the production of semiconductor wafers (Kotani, col. 2, lines 15-17)* (emphasis added).

In response to applicant's argument that there is no suggestion to combine the references (Appeal Brief, 01/24/2005, first paragraph pg. 6), the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either

in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, examiner would like to kindly point out to applicant that motivation has been provided above with regards to the combination of Kleinknecht in view of Kotani and *can be found in the last line of the second paragraph of the rejection to claim one above* (emphasis added). For further clarification of the record, not only do the references pertain to the same technical field of semiconductor device manufacturing, motivation can be found within Kleinknecht (col. 4, lines 38-46) as well, which further strengthens the motivation cited within Kotani for the combination of the two references.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning (Remarks section, 06/25/2004, first paragraph pg. 11), it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

In response to applicants argument that neither of the claimed references discloses the step of *creating a library* comprised of a plurality of *calculated trace profiles of implant regions having varying implant profiles* (Appeal Brief, 01/25/2005, last paragraph pg. 6), examiner kindly points to col. 3, line 57-col. 4, line 5 (*especially col. 4, lines 2-5*) of Kotani which discloses the said limitation noted above (emphasis added). It is the position of the Office that the data accumulation means 20 of Kotani provides for "statistical computation", i.e. calculation,

using the data obtained from various tests such as wafer tests, e.g. an ion implantation test on a wafer as taught in Kleinknecht, and then stores both calculated and uncalculated data in the data accumulation means 20. It is obvious to someone of ordinary skill in the art at the time of the claimed invention, that the references as disclosed by examiner can read on the applicants claimed limitation. Specifically starting at col. 3, line 62 where Kotani discloses "The data accumulation means 20 accumulates and *stores various* data which have been acquired over a long a long period of time...data accumulation means 20 also provides for *reference* to the accumulated data...for *statistical computation* using these data" (emphasis added). So it can be seen that Kotani uses a database i.e. library, for storing data accumulated as well as statistical computations. Going back to Kleinknecht, it can be seen that Kleinknecht further discloses a plurality of calculated trace profiles of implant regions having varying implant profiles (col. 4, lines 3-19). Further, it seems applicant is arguing examiners position that the database 15 of Kotani does not read on applicants claimed library, in essence the two words are synonyms, both are used to organize groups of objects (data) for study. Applicant has not provided any evidence within the specification or applicant's arguments to prove why these two terms are dissimilar. Therefore, the combination of Kleinknecht in view of Kotani discloses applicants claimed invention and the rejection is maintained.

Claim 2

Kleinknecht in view of Kotani discloses a method further comprising generating an additional trace profile for an additional plurality of implant regions formed in said substrate or additional substrates. The said additional plurality of implant regions having an implant profile different from said first plurality of implant regions (Kleinknecht, col. 2, line 28-col. 3, line 54).

Kleinknecht in view of Kotani discloses several patterns were fabricated, and it is obvious to someone of ordinary skill in the art at the time of the claimed invention that one would want to obtain different implant depth profiles for different implantation depths and implant concentration levels of the several fabricated profiles in order to save considerably in man-hours needed for taking four-point sheet resistance tests (Kleinknecht, col. 2, lines 28-40 & col. 4, lines 32-46).

Claims 4-7

Kleinknecht in view of Kotani discloses a light source, a grating structure, P and N-type dopant materials, and an implant depth profile comprised of a dopant concentration level (Kleinknecht, col. 2, lines 28-40 & col. 3, lines 5-54).

3. Claims 1,2, 4-7, & 16-30 rejected under 35 U.S.C. 103(a) as being unpatentable over Campion et al. (USPN '119, hereinafter Campion) in view of Kotani and further in view Kleinknecht.

Claim 1

Campion discloses in conjunction with Fig. 2, a method comprising of providing a semiconductor substrate 10 and forming a implant region 14 in the substrate 10. Campion discloses illuminating 18 a first plurality of implant regions 14 with a light source 26 in a scatterometry tool generating a trace profile corresponding to an implant profile of said implant regions (col. 3, lines 15-22, col. 4, lines 34-52, & col. 11, lines 3-40). Further, Campion discloses calculated trace profiles of implant regions having varying implant profiles (col. 6, lines 48-col. 7, line 17, col. 9, lines 10-25, & col. 11, lines 35-37-*especially col. 6, lines 54-61*).

Campion substantially teaches the claimed invention except that it fails to show providing a library comprised of a plurality of calculated trace profiles of implant regions having varying implant profiles. Kotani shows that it is known to provide a library (database 15, Fig. 1) comprised of a plurality of calculated trace profiles of implant regions having varying implant profiles (col. 1, lines 22-25, col. 3, line 57-col. 4, line 5 & col. 4, line 53-col. 5, line 5) for manufacturing semiconductor devices. It would have been obvious to someone of ordinary skill in the art to combine the device of Campion with the library (database 15, Fig. 1) of calculated (statistical computation) data of Kotani for the purposes of providing a means for managing the production of semiconductor wafers (Kotani, col. 2, lines 15-17).

Campion in view of Kotani substantially teaches the claimed invention except that it fails to show forming a first plurality of implant regions. Kleinknecht shows that it is known to provide forming a first plurality of implant regions having varying implant profiles 14 (col. 3, lines 5-42 & col. 4, lines 3-19, Fig. 1 & TABLE 1) for an semiconductor measurement apparatus. It would have been obvious to someone of ordinary skill in the art to combine the device of Campion in view of Kotani with the forming of a plurality of implant regions of Kleinknecht for the purposes of providing carrier concentration measurements within a diffraction grating pattern on a semiconductor wafer (Kleinknecht, col. 3, lines 43-47). While Campion teaches measuring the dopant (carrier) concentration of an implant region within a semiconductor wafer, Campion is silent with regard to forming a plurality of implant regions, also varying implant regions. It is the position of the Office that this limitation would have been obvious and well known to someone of ordinary skill in the art since it is well known that in

order to form diffraction gratings, a plurality of implant regions need be formed as taught by Kleinknecht and disclosed above.

Claim 2

Campion in view of Kotani and further in view of Kleinknecht disclose a method further comprising generating an additional trace profile for an additional plurality of implant regions formed in said substrate or additional substrates (col. 6, lines 48-col. 7, line 17, col. 9, lines 10-25, & col. 11, lines 35-37). The said additional plurality of implant regions having an implant profile different from said first plurality of implant regions (Campion, col. 2, line 28-col. 3, line 54). Campion in view of Kotani and further in view of Kleinknecht disclose a series of unknown samples were measured, and it is obvious to someone of ordinary skill in the art at the time of the claimed invention that one would want to obtain different implant depth profiles for different implantation depths and implant concentration levels of the several fabricated profiles in order to save considerably in man-hours needed for taking four-point sheet resistance tests (Campion, col. 2, lines 28-40 & col. 4, lines 32-46).

Claims 4-7

Campion in view of Kotani and further in view of Kleinknecht disclose a light source and/or a multiple wavelength light source (Camion, col 4, lines 53-67). Campion in view of Kotani substantially teaches the claimed invention except that it fails to show a grating structure, P and N-type dopant materials, and an implant depth profile comprised of a dopant concentration level, a grating structure, P and N-type dopant materials, and an implant depth profile comprised of a dopant concentration level (Kleinknecht, col. 2, lines 28-40 & col. 3, lines 5-54) for an semiconductor measurement apparatus. It would have been obvious to someone of ordinary skill

in the art to combine the device of Campion in view of Kotani with the dopant materials, and multiple implant profiles of Kleinknecht for the purposes of providing carrier concentration measurements within a diffraction grating pattern on a semiconductor wafer (Kleinknecht, col. 3, lines 43-47).

Claim 16

Campion discloses in conjunction with Fig. 2, a method of measuring profiles (depth profiles) of implant regions 14 formed in a semiconductor substrate 10 comprising forming a plurality of implant regions 14 in a semiconductor substrate 10. Campion discloses illuminating 18 said plurality of implant regions and measuring light reflected off the substrate to generate a profile trace for said implant regions (col. 3, lines 5-42). Campion discloses comparing the generated profile trace to a calculated profile trace having an associated implant region profile and modifying based upon a deviation between the generated profile trace and the calculated profile trace at least one parameter of an ion implantation process used to form implant regions on subsequently processed substrates (col. 2, lines 31-41 & col. 11, lines 3-50). Further, Campion discloses calculated trace profiles of implant regions having varying implant profiles (col. 6, lines 48-col. 7, line 17, col. 9, lines 10-25, & col. 11, lines 35-37-*especially col. 6, lines 54-61*).

Campion as applied above substantially teaches the claimed invention except that it fails to show comparing the generated profile trace to a calculated profile trace from *a library* where the profile trace from the library has an associated implant region profile (emphasis added). Kotani shows that it is known to provide a library (database 15, Fig. 1) comprised of a plurality of trace profiles of implant regions (col. 1, lines 22-25, col. 3, line 57-col. 4, line 5 & col. 4, line

50-col. 5, line 52) for manufacturing semiconductor devices. It would have been obvious to someone of ordinary skill in the art to combine the device of Campion with the library (database 15, Fig. 1) of Kotani for the purposes of providing a means for managing the production of semiconductor wafers in a semiconductor wafer manufacturing line (Kotani, col. 2, lines 15-17). To further clarify this combination of Campion in view of Kotani as disclosed above, Campion discloses calculated profile characteristics may be recorded for quality control (Campion, col. 11, lines 35-37) and further provided determined, i.e. calculated, profile characteristics to a processor to compare the determined profile characteristic to a desired, i.e. target, profile characteristic (Campion, col. 11, lines 35-45). Kotani is combined into the Campion for it's teaching to use a database, i.e. library, in a semiconductor device production line that can be used to store the measured and/or calculated data for future calculation and/or analysis (Kotani, col. 3, line 57-col. 4, line 5). This combination provides for the storage of the data obtained by Campion for future analysis and comparison in order to provide production line corrections when profile characteristics deviate beyond pre-specified thresholds (Campion, col. 11, line 35-50).

Campion in view of Kotani substantially teaches the claimed invention except that it fails to show forming a first plurality of implant regions. Kleinknecht shows that it is known to provide forming a first plurality of implant regions having varying implant profiles 14 (col. 3, lines 5-42 & col. 4, lines 3-19, Fig. 1 & TABLE 1) for an semiconductor measurement apparatus. It would have been obvious to someone of ordinary skill in the art to combine the device of Campion in view of Kotani with the forming of a plurality of implant regions of Kleinknecht for the purposes of providing carrier concentration measurements within a diffraction grating pattern on a semiconductor wafer (Kleinknecht, col. 3, lines 43-47). While

Campion teaches measuring the dopant (carrier) concentration of an implant region within a semiconductor wafer, Campion is silent with regard to forming a plurality of implant regions. It is the position of the Office that this limitation would have been obvious and well known to someone of ordinary skill in the art since it is well known that in order to form diffraction gratings, a plurality of implant regions need be formed in order to provide for efficient and reliable diffraction from the diffraction grating as taught by Kleinknecht and disclosed above.

Claims 17, 18, 25, & 26

Campion in view of Kotani and further in view of Kleinknecht as applied above further disclose comparing the generated profile trace to a target profile trace and modifying based upon a deviation between the generated profile trace and the target profile trace at least one parameter of an ion implantation process used to form implant regions on subsequently processed substrates (col. 2, lines 31-41 & col. 11, lines 3-50). It is the position of the Office that the desired profile characteristics as taught by Campion are equivalent to both the target profile as claimed by applicant, but also to the claimed calculated profile trace. Campion discloses calculating profile characteristics from a series of unknown samples (col. 6, lines 48-col. 7, line 17, col. 9, lines 10-25, & col. 11, lines 35-37-*especially col. 6, lines 54-61*), it is these calculated profile characteristics that read on both calculated and target profiles.

Claim 19

Campion in view of Kleinknecht discloses wherein measuring the reflected light comprises measuring the intensity of the reflected light (scattered light, i.e. diffusely reflected) (Campion, col. 6, line 48 –col. 8, line 43).

Claims 20

Campion in view of Kotani and further in view of Kleinknecht as applied above disclose providing *a library* (data base) of calculated profiles traces, each of which correspond to a unique profile of an implanted region (emphasis added). Kotani shows that it is known to provide a library (database 15, Fig. 1) comprised of a plurality of trace profiles of implant regions (col. 1, lines 22-25, col. 3, line 57-col. 4, line 5 & col. 4, line 50-col. 5, line 52) for manufacturing semiconductor devices. It would have been obvious to someone of ordinary skill in the art to combine the device of Campion in view of Kotani and further in view of Kleinknecht with the library (database 15, Fig. 1) of Kotani for the purposes of providing a means for managing the production of semiconductor wafers in a semiconductor wafer manufacturing line (Kotani, col. 2, lines 15-17). To further clarify this combination of Campion in view of Kotani and further in view of Kleinknecht as disclosed above, Campion discloses calculated profile characteristics may be recorded for quality control (Campion, col. 6, line 48-col. 7, line 17 & col. 11, lines 35-37) and further provided determined, i.e. calculated, profile characteristics to a processor to compare the determined profile characteristic to a desired, i.e. target, profile characteristic (Campion, col. 11, lines 35-45). Kotani is combined into the Campion for it's teaching to use a database, i.e. library, in a semiconductor device production line that can be used to store measured data for future calculation and/or analysis (Kotani, col. 3, line 57-col. 4, line 5). This combination provides for the storage of the data obtained by Campion for future analysis and comparison in order to provide production line corrections when profile characteristics deviate beyond pre-specified thresholds (Campion, col. 11, line 35-50). The limitation that each profile correspond to a "unique" profile is implicitly taught within Campion.

This can be seen at col. 6, lines 54-57, which discloses "a series of samples having a known amount of dopant material is obtained", i.e. a series of samples having a "unique" amount of dopant. Unique being that each sample is different from the rest in order to create a calibration curve.

Regarding the further limitation in claim 20, it is the position of the Office that even though the reference of Campion in view of Kotani and further in view of Kleinknecht does not specifically disclose providing a library of profile traces **in a library**, it does outline the importance of storing profile characteristics in a processor (database) (col. 4, line 41-63). In light of the applicants disclosure, there is no critically distinguishing providing a **library in a library** feature in the applicants disclosure that exemplifies novelty over prior art disclosure. Therefore producing the same results as the applicant's limitation, therefore the reference of Campion in view of Kotani and further in view of Kleinknecht reads on applicants claimed limitation.

Claims 21 & 22

Official notice taken. It is the position of the Office that it is obvious and well known to someone of ordinary skill in the art at the time of the claimed invention to anneal a semiconductor substrate during the manufacturing process, whether it be before or after an ion implantation process. This is evident because it is well known in the art to perform optical measuring processes to inspect manufactured devices several times during the manufacturing process in order to insure successful process conditions **throughout** the **entire** process.

Claim 23

Campion in view of Kotani and further in view of Kleinknecht discloses a method wherein modifying at least one parameter of an ion implant process comprises modifying at least one of an ion implant energy, an implant angle, a dopant material, and a dopant material concentration (Campion, col. 11, lines 45-50). It is obvious and well known to someone of ordinary skill in the art that during the fabrication process of semiconductor devices, certain process parameters such as implant angles, dopant material and dopant material concentration among others are variable in order to quickly optimize production of the semiconductor devices. Therefore, Applicant will be appreciated that the references of Campion in view of Kotani and further in view of Kleinknecht read on the applicants claimed limitations.

Claim 24

Campion discloses in conjunction with Fig. 2, a method of measuring profiles (depth profiles) of implant regions 14 formed in a semiconductor substrate 10 comprising forming a plurality of implant regions 14 in a semiconductor substrate 10. Campion discloses illuminating 18 said plurality of implant regions and measuring light reflected off the substrate to generate a profile trace for said implant regions (col. 3, lines 5-42). Campion discloses comparing the generated profile trace to a calculated profile trace and modifying based upon a deviation between the generated profile trace and the calculated profile trace at least one parameter of an ion implantation process used to form implant regions on subsequently processed substrates (col. 2, lines 31-41 & col. 11, lines 3-50). Further, Campion discloses calculated trace profiles of implant regions having varying implant profiles (col. 6, lines 48-col. 7, line 17, col. 9, lines 10-25, & col. 11, lines 35-37-*especially col. 6, lines 54-61*).

Campion as applied above substantially teaches the claimed invention except that it fails to show comparing the generated profile trace to a calculated profile trace from *a provided library* where the profile trace from the library has an associated implant region profile (emphasis added). Kotani shows that it is known to provide a library (database 15, Fig. 1) comprised of a plurality of trace profiles of implant regions (col. 1, lines 22-25, col. 3, line 57-col. 4, line 5 & col. 4, line 50-col. 5, line 52) for manufacturing semiconductor devices. It would have been obvious to someone of ordinary skill in the art to combine the device of Campion with the library (database 15, Fig. 1) of Kotani for the purposes of providing a means for managing the production of semiconductor wafers in a semiconductor wafer manufacturing line (Kotani, col. 2, lines 15-17). To further clarify this combination of Campion in view of Kotani as disclosed above, Campion discloses calculated profile characteristics may be recorded for quality control (Campion, col. 11, lines 35-37) and further provided determined, i.e. calculated, profile characteristics to a processor to compare the determined profile characteristic to a desired, i.e. target, profile characteristic (Campion, col. 11, lines 35-45). Kotani is combined into the Campion for it's teaching to use a database, i.e. library, in a semiconductor device production line that can be used to store the measured and/or calculated data for future calculation and/or analysis (Kotani, col. 3, line 57-col. 4, line 5). This combination provides for the storage of the data obtained by Campion for future analysis and comparison in order to provide production line corrections when profile characteristics deviate beyond pre-specified thresholds (Campion, col. 11, line 35-50).

Campion in view of Kotani substantially teaches the claimed invention except that it fails to show forming a first plurality of implant regions. Kleinknecht shows that it is known to

provide forming a first plurality of implant regions having varying implant profiles 14 (col. 3, lines 5-42 & col. 4, lines 3-19, Fig. 1 & TABLE 1) for an semiconductor measurement apparatus. It would have been obvious to someone of ordinary skill in the art to combine the device of Campion in view of Kotani with the forming of a plurality of implant regions of Kleinknecht for the purposes of providing carrier concentration measurements within a diffraction grating pattern on a semiconductor wafer (Kleinknecht, col. 3, lines 43-47). While Campion teaches measuring the dopant (carrier) concentration of an implant region within a semiconductor wafer, Campion is silent with regard to forming a plurality of implant regions. It is the position of the Office that this limitation would have been obvious and well known to someone of ordinary skill in the art since it is well known that in order to form diffraction gratings, a plurality of implant regions need be formed in order to provide for efficient and reliable diffraction from the diffraction grating as taught by Kleinknecht and disclosed above.

Claim 27

Campion in view of Kleinknecht discloses wherein measuring the reflected light comprises measuring the intensity of the reflected light (scattered light, i.e. diffusely reflected) (Campion, col. 6, line 48 –col. 8, line 43).

Claims 28 & 29

Official notice taken. It is the position of the Office that it is obvious and well known to someone of ordinary skill in the art at the time of the claimed invention to anneal a semiconductor substrate during the manufacturing process, whether it be before or after an ion implantation process. This is evident because it is well known in the art to perform optical

measuring processes to inspect manufactured devices several times during the manufacturing process in order to insure successful process conditions **throughout** the **entire** process.

Claim 30

Campion in view of Kotani and further in view of Kleinknecht discloses a method wherein modifying at least one parameter of an ion implant process comprises modifying at least one of an ion implant energy, an implant angle, a dopant material, and a dopant material concentration (Campion, col. 11, lines 45-50). It is obvious and well known to someone of ordinary skill in the art that during the fabrication process of semiconductor devices, certain process parameters such as implant angles, dopant material and dopant material concentration among others are variable in order to quickly optimize production of the semiconductor devices. Therefore, Applicant will be appreciated that the references of Campion in view of Kotani and further in view of Kleinknecht read on the applicants claimed limitations.

4. Claims 9, 10, 12, 32, 33, & 35 rejected under 35 U.S.C. 103(a) as being unpatentable over Campion in view of Kleinknecht and further in view Kotani.

Claims 9 & 32

Campion in view of Kleinknecht as applied above substantially teaches the claimed invention except that it fails to show correlating the generated profile trace to a profile trace from *a library* where the profile trace from the library has an associated implant region profile (emphasis added). Kotani shows that it is known to provide a library (database 15, Fig. 1) comprised of a plurality of trace profiles of implant regions (col. 1, lines 22-25, col. 3, line 57-col. 4, line 5 & col. 4, line 50-col. 5, line 52) for manufacturing semiconductor devices. It would

have been obvious to someone of ordinary skill in the art to combine the device of Campion in view of Kleinknecht with the library (database 15, Fig. 1) of Kotani for the purposes of providing a means for managing the production of semiconductor wafers in a semiconductor wafer manufacturing line (Kotani, col. 2, lines 15-17). To further clarify this combination of Campion in view of Kleinknecht and further in view of Kotani as disclosed above, Campion in view of Kleinknecht discloses calculated profile characteristics may be recorded for quality control (Campion, col. 11, lines 35-37) and further provided determined, i.e. calculated, profile characteristics to a processor to compare the determined profile characteristic to a desired, i.e. target, profile characteristic (Campion, col. 11, lines 35-45). Kotani is combined into Campion in view of Kleinknecht for it's teaching to use a database, i.e. library, in a semiconductor device production line that can be used to store measured data for future calculation and/or analysis (Kotani, col. 3, line 57-col. 4, line 5). This combination provides for the storage of the data obtained by Campion in view of Kleinknecht for future analysis and comparison in order to provide production line corrections when profile characteristics deviate beyond pre-specified thresholds (Campion, col. 11, line 35-50).

Claims 10 & 33

Campion in view of Kleinknecht and further in view of Kotani as applied above discloses modifying based upon a deviation between the generated profile trace and a calculated profile trace from the library, at least one parameter of an ion implantation process used to form implant regions on subsequently processed substrates (Campion, col. 2, lines 31-41 & col. 11, lines 3-50).

Claims 12 & 35

Campion in view of Kleinknecht as applied above substantially teaches the claimed invention except that it fails to show providing *a library* of calculated profiles traces, each of which correspond to a unique profile of an implanted region (emphasis added). Kotani shows that it is known to provide a library (database 15, Fig. 1) comprised of a plurality of trace profiles of implant regions (col. 1, lines 22-25, col. 3, line 57-col. 4, line 5 & col. 4, line 50-col. 5, line 52) for manufacturing semiconductor devices. It would have been obvious to someone of ordinary skill in the art to combine the device of Campion in view of Kleinknecht with the library (database 15, Fig. 1) of Kotani for the purposes of providing a means for managing the production of semiconductor wafers in a semiconductor wafer manufacturing line (Kotani, col. 2, lines 15-17). To further clarify this combination of Campion in view of Kleinknecht and further in view of Kotani as disclosed above, Campion if view of Kleinknecht disclose calculated profile characteristics may be recorded for quality control (Campion, col. 6, line 48-col. 7, line 17 & col. 11, lines 35-37) and further provided determined, i.e. calculated, profile characteristics to a processor to compare the determined profile characteristic to a desired, i.e. target, profile characteristic (Campion, col. 11, lines 35-45). Kotani is combined into the Campion for it's teaching to use a database, i.e. library, in a semiconductor device production line that can be used to store measured data for future calculation and/or analysis (Kotani, col. 3, line 57-col. 4, line 5). This combination provides for the storage of the data obtained by Campion for future analysis and comparison in order to provide production line corrections when profile characteristics deviate beyond pre-specified thresholds (Campion, col. 11, line 35-50). The limitation that each profile correspond to a "unique" profile is implicitly taught within Campion.

This can be seen at col. 6, lines 54-57, which discloses "a series of samples having a known amount of dopant material is obtained", i.e. a series of samples having a "unique" amount of dopant. Unique being that each sample is different from the rest in order to create a calibration curve.

It is the position of the Office that adding the further limitation of **historical** profile traces does not add patentable weight, therefore, the reference of Kleinknecht in view of Kotani reads on the claimed limitations.

5. Claims 8, 11, 13-15, 31, 34, 36, & 37 rejected under 35 U.S.C. 103(a) as being unpatentable over Campion in view of Kleinknecht.

Claim 8

Campion discloses in conjunction with Fig. 2, a method of measuring profiles (depth profiles) of implant regions 14 formed in a semiconductor substrate 10 comprising forming a plurality of implant regions 14 in a semiconductor substrate 10. Campion discloses illuminating 18 said plurality of implant regions and measuring light reflected off the substrate to generate a profile trace for said implant regions (col. 3, lines 5-42). Campion discloses comparing the generated profile trace to a target profile trace and modifying based upon a deviation between the generated profile trace and the target profile trace at least one parameter of an ion implantation process used to form implant regions on subsequently processed substrates (col. 2, lines 31-41 & col. 11, lines 3-50).

Campion substantially teaches the claimed invention except that it fails to show forming a first plurality of implant regions. Kleinknecht shows that it is known to provide forming a first

plurality of implant regions having varying implant profiles 14 (col. 3, lines 5-42 & col. 4, lines 3-19, Fig. 1 & TABLE 1) for an semiconductor measurement apparatus. It would have been obvious to someone of ordinary skill in the art to combine the device of Campion with the forming of a plurality of implant regions of Kleinknecht for the purposes of providing carrier concentration measurements within a diffraction grating pattern on a semiconductor wafer (Kleinknecht, col. 3, lines 43-47). While Campion teaches measuring the dopant (carrier) concentration of an implant region within a semiconductor wafer, Campion is silent with regard to forming a plurality of implant regions. It is the position of the Office that this limitation would have been obvious and well known to someone of ordinary skill in the art since it is well known that in order to form diffraction gratings, a plurality of implant regions need be formed in order to provide for efficient and reliable diffraction from the diffraction grating as taught by Kleinknecht and disclosed above.

Claims 11 & 34

Campion in view of Kleinknecht discloses wherein measuring the reflected light comprises measuring the intensity of the reflected light (scattered light, i.e. diffusely reflected) (Campion, col. 6, line 48 –col. 8, line 43).

Claims 13, 14, 36, & 37

Official notice taken. It is the position of the Office that it is obvious and well known to someone of ordinary skill in the art at the time of the claimed invention to anneal a semiconductor substrate during the manufacturing process, whether it be before or after an ion implantation process. This is evident because it is well known in the art to perform optical

measuring processes to inspect manufactured devices several times during the manufacturing process in order to insure successful process conditions **throughout** the **entire** process.

Claim 15

Campion in view of Kleinknecht discloses a method wherein modifying at least one parameter of an ion implant process comprises modifying at least one of an ion implant energy, an implant angle, a dopant material, and a dopant material concentration (Campion, col. 11, lines 45-50). It is obvious and well known to someone of ordinary skill in the art that during the fabrication process of semiconductor devices, certain process parameters such as implant angles, dopant material and dopant material concentration among others are variable in order to quickly optimize production of the semiconductor devices. Therefore, Applicant will be appreciated that the reference of Campion in view of Kleinknecht reads on the applicants claimed limitations.

Claim 31

Campion discloses in conjunction with Fig. 2, a method of measuring profiles (depth profiles) of implant regions 14 formed in a semiconductor substrate 10 comprising forming a plurality of implant regions 14 in a semiconductor substrate 10. Campion discloses illuminating 18 said plurality of implant regions and measuring light reflected off the substrate to generate a profile trace for said implant regions (col. 3, lines 5-42). Campion discloses comparing the generated profile trace to a target profile trace and modifying based upon a deviation between the generated profile trace and the target profile trace at least one parameter of an ion implantation process used to form implant regions on subsequently processed substrates (col. 2, lines 31-41 & col. 11, lines 3-50).

Campion substantially teaches the claimed invention except that it fails to show forming a first plurality of implant regions. Kleinknecht shows that it is known to provide forming a first plurality of implant regions having varying implant profiles 14 (col. 3, lines 5-42 & col. 4, lines 3-19, Fig. 1 & TABLE 1) for an semiconductor measurement apparatus. It would have been obvious to someone of ordinary skill in the art to combine the device of Campion with the forming of a plurality of implant regions of Kleinknecht for the purposes of providing carrier concentration measurements within a diffraction grating pattern on a semiconductor wafer (Kleinknecht, col. 3, lines 43-47). While Campion teaches measuring the dopant (carrier) concentration of an implant region within a semiconductor wafer, Campion is silent with regard to forming a plurality of implant regions. It is the position of the Office that this limitation would have been obvious and well known to someone of ordinary skill in the art since it is well known that in order to form diffraction gratings, a plurality of implant regions need be formed in order to provide for efficient and reliable diffraction from the diffraction grating as taught by Kleinknecht and disclosed above.

Campion in view of Kleinknecht discloses a method wherein modifying at least one parameter of an ion implant process comprises modifying at least one of an ion implant energy, an implant angle, a dopant material, and a dopant material concentration (Campion, col. 11, lines 45-50). It is obvious and well known to someone of ordinary skill in the art that during the fabrication process of semiconductor devices, certain process parameters such as implant angles, dopant material and dopant material concentration among others are variable in order to quickly optimize production of the semiconductor devices. Therefore, Applicant will be appreciated that the reference of Campion in view of Kleinknecht reads on the applicants claimed limitations.

Conclusion

"Several facts have been relied upon from the personal knowledge of the examiner about which the examiner took Official Notice. Applicant must seasonably challenge well known statements and statements based on personal knowledge when they are made by the Board of Patent Appeals and Interferences. In re Selmi, 156 F.2d 96, 70 USPQ 197 (CCPA 1946); In re Fischer, 125 F.2d 725, 52 USPQ 473 (CCPA 1942). See also In re Boon, 439 F.2d 724, 169 USPQ 231 (CCPA 1971) (a challenge to the taking of judicial notice must contain adequate information or argument to create on its face a reasonable doubt regarding the circumstances justifying the judicial notice). If applicant does not seasonably traverse the well-known statement during examination, then the object of the well known statement is taken to be admitted prior art. In re Chevenard, 139 F.2d 71, 60 USPQ 239 (CCPA 1943). A seasonable challenge constitutes a demand for evidence made as soon as practicable during prosecution. Thus, applicant is charged with rebutting the well-known statement in the **next reply** after the Office action in which the well known statement was made."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Juan D. Valentin II whose telephone number is (571) 272-2433. The examiner can normally be reached on Mon.-Fri..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr. can be reached on (571) 272-2800 ext. 77. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Juan D Valentin II
Examiner 2877
JDV
April 3, 2005

Gregory J. Toatley, Jr.
Supervisory Patent Examiner
4/APR/05